

Initially, the Examiner is thanked for the courtesy of the interview conducted with the Applicants' attorney on March 28, 2000.

The objection to Claims 5-14 and 18-20 under 37 CFR §1.75(c) for being in improper multiply dependent form is hereby overcome by the placement of such Claims 5-14 and 18-20 into proper dependent form. Therefore, withdrawal of the objection under 37 CFR §1.75(c) and examination of these claims on their merits are respectfully requested.

The rejection of Claims 1-3 and 15 under 35 U.S.C. §102(b) for anticipation and the rejection of Claims 4, 16 and 17 under 35 U.S.C. §103(a) for obviousness over the U.S. Patent of Miller are hereby traversed. In order to overcome these rejections, all Claims 1-4 and 15-17 have been amended. A comparison of the present invention with the prior art device shown by Miller follows along with a discussion of the amended claims.

An object of the present invention is to prevent abrasion of a solid catalyst. Specifically, as recited in the specification starting on page 6, line 23, through page 7, line 8, this invention provides an apparatus capable of treating waste water in a stable manner over a long period of time by solving problems, such as the deterioration of the performance of the solid catalyst, the lowering of the efficiency of waste water treatment, and the rise of a pressure loss by effectively preventing the following: first, abrasion of the solid catalyst, mainly caused by movement of the catalyst in the packed bed; and second, abrasion of the catalyst, mainly caused by its collision with waste water at the bottom of the packed bed.

In order to accomplish this object, the present invention has two key features: first, a water permeable pressure layer having an ability to follow up a deformation of the surface of the packed bed of the solid catalyst and/or a solid adsorbent, hereinafter simply referred to as the "packed bed," or a movement of a surface of the packed bed; and second, a layer for dispersing and mitigating an upward stream of waste water and/or waste gas under the packed bed.

The present invention has two other important features: first, a plurality of vertical partitions for dividing the upper part of the packed bed and the water permeable pressure layer into a plurality of segments formed in a vertical direction; and second, the water permeable pressure layer or the dispersing and mitigating layer includes a plurality of rigid metallic or ceramic particles.

In contrast thereto, Miller discloses a liquid treating apparatus for the production of high quality water meeting particular standards for taste, color, odor, pH and mineral content.

Specifically, Miller's apparatus comprises a granular activated carbon bed 30 for taste and odor control, cation exchange resin beads 32 for cation exchange and water softening, and a calcium carbonate bed 34 for increasing pH. These three layers or beds are each composed of granular or particulate material. See column 2, lines 52-66. Filters 36 are arranged between the adjacent layers 30/32 and 32/34 of granular material. Although the filters 36 are free to slide downwardly to accommodate compaction, they horizontally divide the adjacent layers.

Fig. 1 of Miller shows the state of the filter condition while Fig. 3 of Miller shows a state of the backwash condition. As can be clearly seen, Miller's apparatus generally treats a downward stream of water while an upward stream of water is treated as a backwash flow. Furthermore, during the backwash flow, water agitates the particles in the beds and causes them to move upwardly from the positions shown in Fig. 1 to the positions shown in Fig. 3. Please read column 3 at lines 40-47.

The present invention is differentiated from the prior art device of Miller in the subject of the problem to be solved. As mentioned above, the primary object of the present invention resides in effectively preventing abrasion of a solid catalyst, specifically abrasion primarily caused by the movement of the catalyst in the packed bed and also abrasion caused by the collision of the solid catalyst with waste water at the lower part of the packed bed. In

independent Claims 1, 2 and 15, the present invention has specified therein the material for each layer in order to accomplish the above-mentioned object.

On the other hand, Miller has no recognition of the problem to be solved by the present invention. Instead, Miller's invention resides in the liquid treating apparatus for the production of water having good quality. Accordingly, Miller specifies the material to be used in each layer to accomplish his specific object and not the object of the present invention.

The above differences between the problems solved by the present invention and those solved by Miller clearly causes different materials to be used for each layer or packed bed. As discussed previously, the present invention is provided with a water permeable pressure layer at the upper and/or lower part of the packed bed and/or the layer for dispersing and mitigating the upward stream of waste water. Furthermore, the present invention is provided with vertical partitions for dividing the water permeable pressure layer and the upper part of the packed bed. Additionally, the present invention has the water permeable pressure layer and/or the dispersing and mitigating layer made up of a plurality of rigid metal or ceramic particles.

In the outstanding Office Action, the Examiner rejected Claims 1-4 and 15-17 on the grounds that the dispersing/mitigating layer of the present invention is shown by a bed 30, that the packed bed of solid catalyst and/or solid adsorbent is shown by the bed 32, that the water permeable pressure layer is shown by the bed 34 and that the partitions are shown by the filters 36.

The Applicants respectfully disagree with the Examiner's interpretation of the prior art device of Miller for the following reasons. First of all, the bed 30 of Miller is not a dispersing/mitigating layer but rather an adsorbent for treating water. Secondly, the bed 34 of Miller is not a water permeable pressure layer but rather a chemical substance for treating water.

In other words, the activated carbon in the bed 30 and the calcium carbonate in the bed 34 of Miller are merely examples of the materials composing the solid catalyst.

In regard to the differences between the water permeable pressure layer of the present invention and the bed 34 of Miller, the water permeable layer is provided to prevent abrasion of the solid catalyst resulting from mutual movement and vibration thereof while the upward stream of water flows through the packed bed. In order to prevent such abrasion efficiently, it is necessary to select a material for the water permeable pressure layer having specific properties. Ideally, the material should have a sufficient load which can substantially suppress movement of the solid catalyst. This property allows the material to follow up movement/deformation of the packed bed and the water permeability of the pressure layer. To accomplish this result, the present invention uses a substance having great rigidity. Such substances are metal or ceramic particles which meet the requirements discussed above.

On the other hand, Miller uses granular calcium carbonate for the bed 34 which has a very small specific gravity. Accordingly, a person of ordinary skill in this art would not select calcium carbonate to serve as the water permeable pressure layer.

In regard to the differences between the dispersing/mitigating layer of the present invention and the bed 30 used in the prior art device of Miller, the dispersing/mitigating layer is provided at the lower part of the solid catalyst in order to disperse the upward flow of waste water that has been ejected through nozzles provided in the reactor tower. In other words, the dispersing and mitigating layer prevents the ejected waste water from directly and strongly impacting against the bottom of the packed bed. In order to endure the direct impact of the waste water ejected through the nozzles, the present invention requires one of ordinary skill in the art to select a material having a resistance against such abrasion/corrosion and a certain rigidity. In

the present invention, the selected material having such rigidity is a plurality of metal or ceramic particles which are used for the dispersing and mitigating layer.

On the other hand, Miller uses activated carbon for the bed 30. The use of activated carbon in the present invention would easily cause its wearing away in a relatively short period of time. Accordingly, a person of ordinary skill in this art would not select activated carbon to be used in the present invention as the dispersing and mitigating layer.

Furthermore, the present invention is differentiated from the prior art device of Miller in the arrangement of their partitions. In the present invention, vertical partitions are used and are shown in Figs. 10, 11 and 16-19. These partitions vertically divide the upper part of the packed bed and the water permeable pressure layer into a plurality of segments so that the packed bed and the pressure layer can directly contact each other in each segment.

On the other hand, Miller uses horizontal partitions which are the filters 36 to avoid direct contact between the beds 30 and 32 and between the beds 32 and 34. Therefore, the present invention and the prior art device of Miller are differentiated from each other both in their arrangement and in the effects which they obtain.

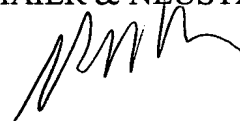
To summarize the above discussion, Miller discloses merely an arrangement in which three different kinds of filters are used for treating waste water. Individually, each filter has a specific purpose during the treatment of the waste water. This prior art arrangement of Miller was not invented for the purpose of reducing the mechanical wearing away of the solid catalyst in the packed bed. The prevention of this mechanical wear is the primary object of the present invention.

Accordingly, careful reconsideration and withdrawal of the rejection of Claims 1-3 and 15 under 35 U.S.C. §102(b) for anticipation by Miller and the rejection of Claims 4, 16 and 17 under 35 U.S.C. §103(a) for obviousness over Miller are earnestly solicited.

Consequently, in view of the foregoing amendments and remarks, no further issues are believed to be outstanding and the present application should be considered in clear condition for formal allowance. Therefore, a quick and favorable action is respectfully requested.

Respectfully submitted,

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